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(71) Applicant *(for all designated States except MG US)*: CAMELOT TECHNOLOGIES LIMITED [CA/CA]; Saddlebrook Industrial Park, Bag 20, High River, Alberta T1V IT4 (CA).

(71) Applicant *(for MG only)*: RITTER, Stephen, David [GB/GB]; Mathys & Squire, 100 Gray's Inn Road, London WC1X 8AL (GB).

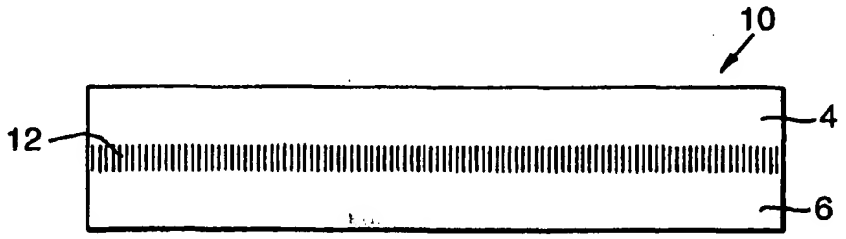
(72) Inventors; and
(75) Inventors/Applicants *(for US only)*: CHEYNE, Ian [CA/CA]; 10 Ravine Drive, R.R. 1, De Winto, Alberta T0L 0X0 (CA). DAN, Ervin [CA/CA]; Apartment 2002, 1200–6 Street Southwest, Calgary, Alberta T2R 1H3 (CA).

(74) Agent: RITTER, Stephen, David; Mathys & Squire, 100 Gray's Inn Road, London WC1X 8AL (GB).

(54) Title: AN ABSORBENT ARTICLE AND PROCESS FOR PRODUCTION THEREFOR

(57) Abstract

A laminate material comprising at least two contiguous layers, with at least one layer comprising fibrous material, at least one layer comprising a superabsorbent and wherein at least one of the layers interpenetrates the other so that the boundary between the layers is diffuse.



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An Absorbent Article and Process for Production Therefor

The present invention relates to absorbent articles. More particularly, it relates to a laminated absorbent article comprising a water-absorbent core layer and adjacent distribution and/or acquisition/layer(s) and to their use in such articles as sanitary products, such as napkins and pads, incontinence garments and disposable diapers. In particular, the present invention relates to such laminated absorbent articles in which the boundary between the said layers of the article is not distinct and at least one of the layers interpenetrates the other. The present invention also relates to a corresponding process for the production of such laminates.

As used herein, the term "water", when used alone or in the phrases "water-absorbing", "water-absorbent", "water-swellable" and "water-management", is understood to mean not only water but also aqueous media such as, in particular, electrolyte solutions such as body fluids. Further, the term "boundary" is understood to mean the interfacial region between adjacent layers of a laminated article, particularly the acquisition layer, the distribution layer and the water-absorbent core layer. In addition, the term "delaminatable" means the ability of adjacent layers of a laminate to separate by peeling the one from the other or by application of a shear stress. Such delamination would normally be facilitated by the presence of water. In addition, a "superabsorbent" material is defined as one which can absorb at least ten times its own mass in water.

Sanitary napkins, pads, incontinence garments and disposable diapers have been known for many years and much effort has been made to improve the functional efficiency of such articles to make them more absorbent, more comfortable to wear and less obtrusive to the wearer.

In general, such products have a core which includes a water-absorbent core layer which acts to store fluid. This water-absorbent core layer may be formed from any suitable water-absorbent material including wood pulp, fluff such as cellulose fluff, rayon and tissue. Additionally, or alternatively, the layer may comprise any of the water-absorbing polymer compositions commonly known as superabsorbent polymers.

A number of absorbent compositions have been developed which exhibit the capacity to be water-absorbing. Known compositions may be in any suitable form including powders, particles and fibres. US 3,954,721 and US 3,983,095, which are incorporated herein by reference, disclose preparations for derivatives of copolymers of maleic anhydride with at least one vinyl monomer in fibrous form. The fibrous copolymers are rendered hydrophilic and water-swellable by reaction with ammonia or an alkali metal hydroxide. US 3,810,468, which is incorporated herein by reference, discloses lightly cross-linked olefin-maleic anhydride copolymers prepared as substantially linear copolymers and then reacted with a diol or a diamine to introduce cross-linking. The resultant lightly cross-linked copolymers are treated with ammonia or an aqueous or alcohol solution of an alkali metal hydroxide. US 3,980,663, which is incorporated herein by reference, describes water-swellable absorbent articles made from carboxylic polyelectrolytes via cross-linking with glycerine diglycidyl ether.

European Published Application No. 0 268 498 (incorporated herein by reference) describes a water-absorbent composition formed by causing a substantially linear polymer of water-soluble ethylenically unsaturated monomer blends comprising carboxylic and hydroxylic monomers to cross-link internally.

Further examples of water-absorbent compositions are those produced from a copolymer of an α,β unsaturated monomer having at least one pendant unit selected from a carboxylic acid group and derivatives thereof and a copolymerisable monomer. A proportion of the pendant units are present in the final copolymer as the free acid and a proportion as the salt of the acid. These copolymers are capable of being cross-linked, either internally or with a variety of cross-linking agents, to form the water-swellable composition. Examples of water-swellable compositions of this type can be found in US 4,616,063, 4,705,773, 4,731,067, 4,743,244, 4,788,237, 4,813,945, 4,880,868 and 4,892,533 and EP 0 272 074, 0 264 208 and 0 436 514 which are incorporated herein by reference.

Derivatives of carboxylic acid groups include carboxylic acid salt groups, carboxylic acid amide groups, carboxylic acid imide groups, carboxylic acid anhydride groups and carboxylic acid ester groups.

Other examples of water-absorbent compositions can be found in US 4,798,861, WO 93/17066, WO 93/255735, WO 93/24684, WO 93/12275, European Published Application Nos 0 401 044, 0 269 393, 0 326 382, 0 227 305, 0 101 253, 0 213 799, 0 232 121, 0 342 919, 0 233 014, 0 268 498 and 0 397 410, British Patent Application Nos 2 082 614, 2 022 505, 2 270 030, 2 269 602 and 2 126 591, U.S. Patent Nos 4,418,163, 3,989,586, 4,332,917, 4,338,417, 4,420,588 and 4,155,957 and French Patent Application No. 2 525 121 which are all incorporated herein by reference.

Water-absorbent material of the kinds referred to in the above-mentioned patents and applications may be in any suitable form including powder, particulate granular and fibers; the fibers may be straight or may be curled and/or crimped. Details of such curly/crimped fibers may be found in US 4,822,453, 4,888,453 5,462,793 and 4,898,462 which are incorporated herein by reference. In one alternative material, the water-absorbent polymer may be coated onto the whole or a part of the surface of other materials such as non-water-absorbent fibers. By "non-water-absorbent" is meant that the fibers before coating do not absorb water to any great extent. Details of one type of fibers of this type may be found in WO 96/15307 which is incorporated herein by reference.

Other kinds of water-absorbent materials may be used as, or as part of, the water-absorbing layer. Suitable materials include naturally occurring water-absorbent materials. One such water-absorbent material is starchy material such as that proposed by the US Department of Agriculture in 1969-1970. Peat moss may also be used a water-absorbent material. In this connection, reference may be made to US 5,477,627 5,429,242 5,374,260 4,992,324 4,676,871 4,573,988 4,560,372 4,540,454 4,537,590 and 4,226,237 which are incorporated herein by reference. Alginates have also been proposed as suitable water-absorbent material. One example

of the use of such alginates is that suggested by Beghin/Kayserberg.

The water-absorbent core layer may be of non-uniform thickness. For example, where the layer is intended for use in a feminine hygiene product or a diaper, the water-absorbent core layer may be shaped such that it is thicker in the crotch region.

As absorbent articles such as feminine hygiene products or diapers often have to cope with a discharge of a substantial volume of water in a short time, the article may additionally include a distribution and/or acquisition layer which, in use, is generally located above and adjacent the water-absorbent core layer. In this context, a distribution and/or acquisition layer is any layer which serves to draw water away from the wearer of the article and wick or spread the water away from the point of initial contact with the article. The water is, therefore, transported to other parts of the water-absorbent layer which allows the surface of the article to be kept as clean and dry as possible, and to spread the absorbence load more evenly throughout the article.

The use of a distribution and/or acquisition layer of this type is advantageous in addressing the problem of pooling if a substantial volume of water is discharged in a short time and thereby gives the user a feeling of dryness. Examples of distribution and/or acquisition layers include those described in EP 0 565 606, GB 2 266 465 and GB 2 278 371 which are incorporated herein by reference.

As the distribution layer serves to wick the water away from the point of initial contact, it is accepted that the water should be transported in the plane of the layer as quickly as possible and thus, distribution layers are generally made of hydrophillic or hydrophobic material such as wood pulp, fluff, bicomponent fibers, polyester, polypropylene or mixtures thereof.

Whatever material is used for the water-absorbent core layer, it is generally backed by a water-impervious backing sheet to protect clothing and the surrounding area from soiling and to prevent leakage of the body fluid which would cause

embarrassment to the user. Any suitable water-impervious backing material may be used.

In addition, the absorbent article may have the added precaution of a second distribution and/or acquisition layer located between the water-absorbent layer and the fluid impervious backing sheet such that any water penetrating the water-absorbent layer is wicked, or spread, along the second distribution and/or acquisition layer. The second distribution and/or acquisition layer may be formed from any suitable hydrophilic or hydrophobic material such as wood pulp, fluff, bicomponent fibers, polyester and polypropylene or mixtures thereof.

The absorbent article may also comprise an acquisition layer which draws water away from the wearer into the distribution layer. Such acquisition layers may be made from any suitable material such as wood pulp, fluff, bicomponent fibers, polyester and polypropylene or mixtures thereof, although it is preferred that the layer comprise a high loft material.

The article generally has a water-permeable, non-woven type cover-sheet which defines the surface of the article which will, in use, be in contact with the user. The cover sheet is intended to insulate the wearer from contact with water that has been absorbed into the core, thus the cover sheet should allow water to pass through it into the core but remain dry and soft to the touch. Any suitable material may be used as the cover-sheet. One example of a suitable cover-sheet is described in US 5,257,982 which is incorporated herein by reference.

Absorbent articles may be produced using a variety of methods depending on the structure of the desired article. For example, with regard to the water-absorbent core layer, the fibrous material may be woven to form the body of the core. However, usually, the core comprises a non-woven web of fibrous material.

The water-absorbent core layer may be in non-fibrous form. Where the water-absorbent core layer is in fibrous form, it may be formed into a non-woven web by any conventional means. Suitable means include air-laying; wet-

laying; needle punching; and hydro entanglement or spin interlacing by air or water jet and carding. Air-laying techniques are widely preferred and in this connection, the fibres are blown into a chamber and allowed to fall onto a continuous belt conveyor. This conveyor may have a plurality of small holes dispersed throughout the belt, through which the air from the chamber may continually be drawn using vacuum means. The evacuation of the air assists the fibres to form a non-woven web on the surface of the belt conveyor. The newly formed web of water-absorbent core material may then be passed between calender rollers to provide a sheet of the desired thickness throughout. The formed web is then bound together by the application of heat and bicomponent fibres; or by heat and crosslinkable latex materials.

The sheet of material is removed from the conveyor belt; then cut into discrete shapes, the shape being dependent on the nature of the final article. One surface of the water-absorbent core layer may be coated with a chemical substance, such as an adhesive; and a distribution layer and/or acquisition is then placed onto the shaped absorbent core.

The resultant product is then fashioned into the required article with the addition of a back sheet, a top sheet and any other parts as required.

The conventional process for the formation of absorbent articles, described above, has a number of drawbacks. One such drawback is that the process involves a large number of steps between the formation of the water-absorbent core layer and the production of the finished article. Therefore, the process can be both complicated, time-consuming and costly.

It is important that absorbent articles such as sanitary napkins and pads, incontinence pads and disposable diapers display a number of characteristics. In this connection, obviously, it is desirable that the articles display as short water acquisition times and as high overall water absorbency as possible. Acquisition times are reduced in proportion with the increase in the ability of the article to wick, or spread, the water away from the initial point of contact with the absorbent article. Once the water has

been absorbed, however, it is also important that the amount of water which escapes from the absorbent article is minimised. Water which escapes from the article through the upper layer renders the article damp to the touch and rewet is a measure of how dry the articles feel to the touch after water-absorption. This is generally measured under load. Rewet is of particular importance to the absorbent articles of the present invention as a damp article will make the user feel damp and uncomfortable. Clearly, it is desirable that the absorbent article display low rewet properties.

In addition, the article should not leak and the integrity of the water-absorbent core should remain intact after absorption of water.

Conventional articles often have to sacrifice low rewet properties if they are to display low acquisition times and high overall absorbencies. Other articles which have low acquisition times and display good absorbency, often display high rewet.

Clearly, it is desirable to optimise the level of rewet with both absorbency and acquisition time. In addition, it is desirable that the article is as compact as possible such that the user does not feel encumbered during use.

In the past, in order to improve fluid acquisition by binding, successive layers have been bonded together through the use of a chemical adhesive. However, there are several drawbacks associated with the use of such adhesives.

Firstly, the adhesives used must have special characteristics. In this connection, the adhesives must be water-resistant if the finished article is to maintain its integrity during use. However, under certain conditions of use, the adhesive may not be sufficient to maintain this integrity; and, in this case, the layers in an absorbent article may come apart from each other; in addition, the presence of the adhesive might interfere with fluid distribution and absorption. In addition, the presence of the adhesive might interfere with fluid distribution and absorption.

Secondly, use of these adhesives adds to the overall cost of producing the absorbent articles. Further, the application of the adhesive adds a further step to the overall process for the production of absorbent articles which not only increases the cost of production but also increases the length of time needed to produce the absorbent articles.

We have now discovered that if the fibres of the water-absorbent core layer actually penetrate the body of the distribution and/or acquisition layer, then the fluid flow between the two layers is improved. Moreover, the improvement in fluid flow in turn leads to an unexpected improvement in the absorbency and rewet characteristics of the article itself. In addition to improved characteristics, such penetration of the water-absorbent core layer into the distribution and/or acquisition layer also has the added benefit of negating the need for chemical adhesives to bond the two layers together, thereby not only making the process of their production less expensive but also reducing the number of process steps and allowing production speeds to be increased.

In addition, as the boundary becomes more diffuse through the penetration of the absorbent core layer into the distribution and/or acquisition layer, the two layers themselves become increasingly resistant to delamination.

Thus, according to the first aspect of the present invention, there is provided a laminated absorbent article comprising a fibrous water-absorbent core layer and a fibrous distribution and/or acquisition layer adjacent the water-absorbent core layer, said layers being substantially non-delaminatable in the absence of a chemical adhesive.

Further and in accordance with the second aspect of the present invention there is provided a laminated absorbent article comprising a water-absorbent core layer and a distribution and/or acquisition layer adjacent the water-absorbent core layer and in which the boundary between the two layers is diffuse.

In addition and in accordance with a third aspect of the present invention there is provided a laminated absorbent article comprising at least a water-absorbent core layer and a distribution and/or acquisition layer in which the boundary between the two layers is more diffuse than the boundary between the corresponding layers in an article formed by the known process of air-laying the core layer and, thereafter, depositing the distribution and/or acquisition layer on the core layer. In addition, the absorption layer and in the distribution layer and/or the acquisition layer can be needled together.

In accordance with a fourth aspect of the present invention there is provided a disposable diaper, a sanitary napkin or pad or an incontinence garment which comprises the laminated absorbent article of the present invention.

We have also now discovered an alternative process for the formation of a laminate of water-absorbent core layer and distribution and/or acquisition layer for use in absorbent articles and which is suitable for use in the manufacture of the laminates of the invention. As explained above, in the known process, the core layer is formed first and the distribution and/or acquisition layer is then deposited on it. It has now been found that if the water-absorbent core layer is formed directly onto a preformed distribution and/or acquisition layer then the overall process to form an absorbent article is simplified.

Further, a laminate absorbent article produced using this process will have a diffuse boundary between the water-absorbent core layer and the distribution layer and/or the acquisition layer and/or between the distribution and acquisition layers which results in a decrease in the ability of the layers to delaminate in use. The diffuse boundary arises from the physical integration of the fibers of one layer penetrating the body of the other fibrous layer. Such physical integration negates to need for chemical or thermal bonding between the layers and improves the absorption characteristics of the absorbent article.

Thus, in accordance with a fifth aspect of the present invention there is provided a

process for the production of the laminated absorbent article of the present invention comprising the steps of providing a fibrous distribution layer and forming a water-absorbent core layer by air-laying absorbent fibers on to the distribution and/or acquisition layer to form a laminate or by needle punching, hydroentangling or spin lacing the adjacent layers together.

According to the first aspect of the present invention, it is essential that the water-absorbent core layer is substantially nondelaminatable from the distribution layer in the absence of any chemical adhesive. This is achieved by having the material of one layer actually penetrate the body of the second layer.

Conventional laminated absorbent articles have a certain degree of physical integration between adjacent fibrous layers. However, this integration arises merely from the contact of the fibres on the surfaces of two layers. As a consequence of this low level of physical integration, other means such as chemical adhesives, are employed to minimise the effect of the interface between layers.

In a preferred arrangement of the present invention, the water-absorbent core layer comprises a non-woven web of fibers which may additionally, or alternatively, comprise superabsorbent material. The superabsorbent material may be present in any suitable form such as powder, granular, particulate, aggregate, a coating or fibers. The water-absorbent core layer may comprise any suitable water-absorbing materials such as wood pulp, fluff, rayon, tissue or bicomponent fibers. These materials may be present either alone or in any particular combination depending on the requirements of the finished article.

The acquisition layer may comprise a high loft, non-woven web of fibers. As the acquisition layer acts to spread the water from the point of contact with the finished absorbent article throughout the article to prevent saturation of the article at one point, it is desirably manufactured from a non-absorbent material; any suitable material may be used although polyester and polypropylene, either alone or in a particular combination, are preferred.

The distribution layer may comprise a non-woven web of fibers. As the distribution layer acts to spread the water from the point of contact with the finished absorbent article throughout the article to prevent saturation of the article at one point, it is desirably manufactured from a non-absorbent material; any suitable material may be used although polyester and polypropylene, either alone or in a particular combination, are preferred.

It is preferred that the fibres of the absorbent core penetrate the body of the adjacent layer, although it is to be understood that the present invention also encompasses the arrangement in which the fibers of the distribution and/or acquisition layer penetrate the body of the water-absorbent core layer.

The bonding between the water-absorbent core layer and the distribution and/or acquisition layer, whilst provided sufficiently by the penetration of the fibers of one layer into the body of the other layer, may be enhanced by conventional bonding, e.g. thermal or latex bonding. Accordingly, in an alternative arrangement of the present invention, an adhesive coating is provided on the distribution and/or acquisition layer such that when the water-absorbent layer is laminated to the distribution layer, the two layers are chemically bonded to each other, in addition to the mechanical bonding due to the physical integration of the layers.

In a further preferred arrangement, the laminated absorbent article also comprises perforations throughout the distribution and/or acquisition layer which extend in to the body of the absorbent core layer. These perforations may be formed by any suitable means although needle-punched perforations are preferred. The act of perforating the laminated absorbent article may also serve to increase the physical integration of the two layers thereby improving the absorption and rewet properties.

The laminated absorbent article may also comprise an acquisition layer bonded to the distribution or absorption layer. The presence of such an acquisition layer increases the rate at which the water is drawn from the wearer into the absorbent layer. This layer may be made from any suitable material; however, it is preferred that a non-

absorbent material be used. In this connection, the acquisition layer may comprise a high loft, non-woven web of wood pulp, fluff, polyester, polypropylene and/or bicomponent fibers.

The laminated absorbent article further comprises a top sheet and a water-impervious backing sheet.

With regard to the process for the production of the present invention, a distribution and/or acquisition layer is provided on to which a layer of water-absorbent fibres is air-laid. The water-absorbent fibres may be air-laid under vacuum provided the distribution layer is permeable to the flow of air. Following the air-laying of the water-absorbent core on to the distribution layer, the laminate may be passed under a single calender roller or between a pair of such rollers. This serves to provide a laminate of uniform thickness throughout if required for use in an article with a particular purpose.

The air-laid layers may then be thermally or latex bonded together. In the alternative, following the air-laying of the water-absorbent core, the resultant laminate is simply needle-punched or hydroentangled or spun laced together with the distribution and/or acquisition layer to provide the diffuse boundary as necessary. In this connection, needle-punching, hydroentangling and spin lacing is achieved in any suitable way.

An acquisition layer, a top sheet and/or a water-impervious backing sheet may then be bonded to the laminated absorbent article.

In the event that a continuous length of the distribution layer is air-laid with the water-absorbing material, the resultant continuous length of air-laid laminate may be cut into individual shapes, the dimensions of which are dependent on the requirements of the finished article.

A particularly preferred embodiment of the present invention will now be described,

with reference to the accompanying drawings in which:

Figure 1 is a schematic cross-sectional view of a conventional laminated absorbent article;

Figure 2 is a schematic cross-sectional view of the laminated absorbent article of the present invention; and

Figure 3 is a schematic diagram of a process used for the production of the laminated absorbent article of the present invention.

Figure 1 refers to a conventional laminated absorbent article 2 which comprises a distribution layer 4 and a water-absorbent core layer 6. A chemical adhesive is applied to the upper surface of the water-absorbent core layer and the distribution layer is then bonded to the core layer. This arrangement provides a laminate with a substantially distinct boundary region 8.

In Figure 2, the laminated absorbent article 10 of the present invention comprises the distribution layer 4 and the water-absorbent core layer 6. However, the boundary layer 12 is diffuse with fibers from the absorbent layer penetrating the body of the distribution layer.

The physical integration between the fibers of one layer and the body of fibers of the other layer effectively bonds the layers together without the need for additional bonding means and also improves the absorbent properties of the absorbent product. However, other means may be used to enhance the bonding between the layers; for example, needle punching, hydroentangling and spin lacing.

Figure 3 depicts a much simplified schematic diagram of the process for forming the laminated absorbent article 10 of the present invention. In this process, a layer of high loft material, the distribution layer 4, is run on to a continuous belt conveyor 14. The distribution layer travels on the conveyor belt into a hood 16 which comprises

a fibre inlet 18. Absorbent fibers 20 enter the hood via the inlet and fall towards the distribution layer. The conveyor belt has a plurality of perforations (not shown) distributed throughout its surface. These perforations allow the air from the hood to be drawn out by the vacuum box 22 through the outlet 28. The removal of the air forcibly positions the fibers on to the distribution layer such that the fibers actually penetrate the body of the distribution layer. The laminated absorbent article begins to form 24 and, once formed, the laminate travels out of the hood and between a pair of calendar rollers 26. The air-laid portion of the laminate is then bound together by the use of heat and either bicomponent fibers or a latex solution. The laminated absorbent article is then removed from the belt conveyor and processed to form the desired absorbent article.

CLAIMS:

1. A laminate material which comprises at least two contiguous layers wherein:
   i) the layers differ in composition;
   ii) at least one of the layers comprises fibrous materials;
   iii) at least one of the layers comprises a superabsorbent (as herein defined); and
   iv) at least one of the layers interpenetrates the other, the material being capable of absorbing aqueous media on contact therewith.

2. A material according to Claim 1 wherein the composition of one of the layers enables it, in service, to function as an absorption, or core, layer.

3. A material according to Claim 1 or 2 wherein the composition of one of the layers enables it, in service, to function as a distribution layer.

4. A material according to Claims 1 to 3 wherein the composition of one of the layers enables it, in service, to function as an acquisition layer.

5. A material according to any preceding claim wherein the two contiguous layers comprise an absorption layer, and, on one side thereof, a distribution layer.

6. A material according to Claim 5 comprising a fibrous water-absorbent core layer and a fibrous distribution layer adjacent to the absorbent core layer, said layers being substantially non-delaminatable in the absence of an adhesive.

7. A material according to Claim 5 comprising a fibrous water absorbent core layer and a fibrous distribution layer adjacent to the water-absorbent core layer wherein the boundary between the two layers is diffuse.

8. A material according to claim 7 wherein the boundary between the two layers is more diffuse than the boundary between the corresponding layers in an

article formed by the known process of air-laying the core layer and thereafter, depositing the distribution layer on the core layer.

9. A material according to any one of Claims 5 to 8 wherein the other side of the absorption layers is contiguous with a further distribution layer.

10. A material according to Claim 9 wherein one of the absorption layer and the further distribution layer interpenetrates the other.

11. A material according to any preceding claim wherein the distribution layer is contiguous with an acquisition layer.

12. A material according to Claim 11 wherein one of the distribution layer and the acquisition layer interpenetrates the other.

13. A material according to any preceding claim wherein both contiguous layers ii) and iii) comprise fibrous material.

14. A material according to any preceding claim wherein the absorbent or core, layer comprises a non-woven web of fibers.

15. A material according to any preceding claim wherein the absorbent, or core, layer additionally or alternatively includes superabsorbent material.

16. A material according to any preceding claim wherein the distribution layers comprises a non-woven web of fibers.

17. A material according to any preceding claim wherein the acquisition layer comprises a non-woven web of fibers.

18. A material according to any preceding claim which further comprises perforations through the distribution layer into the body of the absorbent, or

core, layer.

19. A laminate absorbent article comprising a laminate material according to any preceding claim wherein the article further comprises at least one of a water-impervious backing sheet and a top sheet.

20. A female sanitary product, an incontinence garment or a disposable diaper comprising the laminate absorbent article according to Claim 19.

21 A process for the production of a laminate absorbent material comprising:

providing a fibrous distribution layer; and

forming an absorbent, or core, layer on said distribution layer by air-laying absorbent fibers on to the distribution layer to form a laminate.

22. A process according to Claim 21 wherein said absorbent layer includes superabsorbent material.

23. A process for the production of a laminate absorbent material comprising:

providing a fibrous distribution layer;

providing a contiguous absorbent, or core, layer;

and hydroentangling or spin lacing said layers together.

24. A process for the production of a laminate absorbent material comprising:

providing a fibrous distribution layer;

providing a contiguous absorbent, or core, layer; and perforating the material such that the perforations extend through the distribution layer into the body of the absorbent, or core, layer.

25. A process according to Claim 24 wherein the perforations are formed by needle-punching.

26. A process according to any one of Claims 21 to 25 wherein an acquisition

layer is provided on the exposed surface of the distribution layer of the laminate absorbent material.

27. A process according to Claim 26 wherein a top sheet is provided on the exposed surface of the acquisition layer of the laminated absorbent article.

28. A process according to any one of Claims 21 to 25 wherein a top sheet is provided on the exposed surface of the distribution layer.

29. The process according to any one of Claims 21 to 25 wherein a water-impervious backing sheet is provided on the exposed surface of the absorbent core layer of the laminated absorbent article.

Fig.1.
PRIOR ART

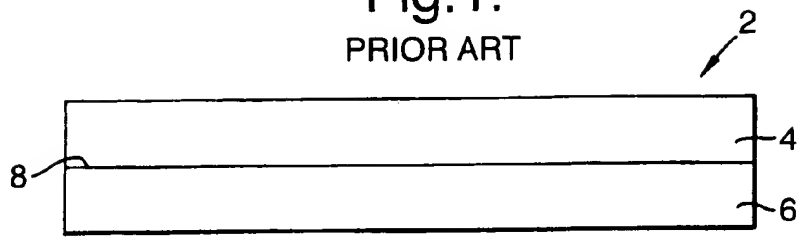


Fig.2.

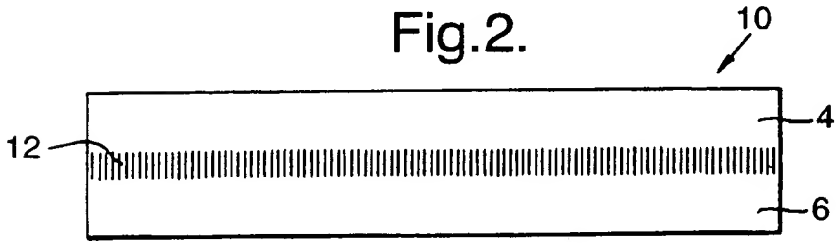
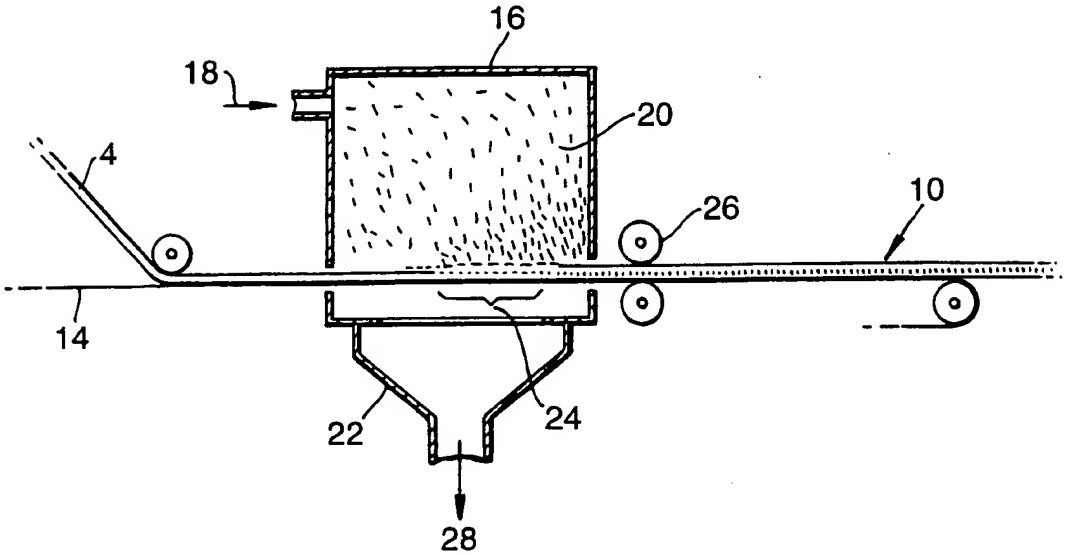


Fig.3.



INTERNATIONAL SEARCH REPORT

In tional Application No
PCT/GB 99/04427

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 A61F13/15

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 A61F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0 140 470 A (PERSONAL PRODUCTS CO) 8 May 1985 (1985-05-08) page 8, line 21 - line 34 page 9, line 31 - line 36 page 11, line 13 - line 24 page 13, line 23 - line 36; figures 3,7	1-7, 9-17, 20-29
A	US 5 188 624 A (LANCASTER E PETER ET AL) 23 February 1993 (1993-02-23) abstract column 16, line 25 - line 36; figures 1,2,7	1-22
A	DE 35 25 379 A (KLAUS HAGENMEYER GMBH) 22 January 1987 (1987-01-22) column 5, line 32 - line 43; claim 1; figures 1,5	1-4,16, 17,19-21

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
30 March 2000	11/04/2000

Name and mailing address of the ISA	Authorized officer
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Information on patent family members

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